3. *Exoskeleton formed of real bone*; partly in association with homogeneous osteoid substance (*ganoin*) and dentinal tubes.

Scales of Ganoidei, of *Lepidosiren*, some Siluroidei, of Mormyri, many Characini and Clupeini, also of *Thynnus*.

In terminating this communication, I think it proper to mention that the great liberality with which my friend Mr. Tomes of London, and Professor Williamson of Manchester, put their large collections of microscopic preparations of teeth, bones, and scales at my disposal, proved of great assistance in my investigations, and, accordingly, I am only fulfilling an agreeable duty in now publicly expressing my obligations to them. I am also greatly indebted to my friends Filippo de Filippi of Turin and Henry Müller of Würzburg, also to Dr. Hyrtl of Vienna, and Dr. Peters of Berlin, who supplied me with many of the rarer Mediterranean and foreign fishes. But, in order that my observations may yield the results which may not unreasonably be expected from them, I need more aid; and as England is the country in which not only the largest zoological collections of fishes, but also the greatest number of microscopic preparations of the hard tissues of recent and fossil animals, are to be found, I take the liberty to ask the possessors of such collections who may be interested in this matter to favour me with such specimens as may seem to them calculated to give to this series of observations the greatest possible extension.

III. "On the Physical Phenomena of Glaciers."—Part II. By Dr. Tyndall, F.R.S. Received February 24, 1859.

[Abstract.]

The main portion of this Paper deals with the *veined structure* of glacier ice. The author refers to his observations in the Mer-de-glace in 1857, and his reasons for withholding them, and visiting the glaciers once more in 1858.

He describes the general aspect of the structure, and examines the two theories of the phenomenon which are now deserving of attention; one of these considers the blue veins to be a continuation of the bed-

ding of the Névé, the other regards them as being produced by pressure.

Wishing to confer upon the inquiry the character of an *experimental* one, his desire in 1858 was to examine a great number of glaciers, which should exhibit the ice under different mechanical conditions, thus accepting the combinations made by nature as a substitute for those, which, under ordinary circumstances, are made by the experimentalist himself. He therefore first visited and examined the glaciers of Grindelwald. Crossing the Strahleck, he descended the glacier of the Aar to the Grimsel, and proceeded thence to the glacier of the Rhone. He subsequently spent eight days in the neighbourhood of the great Aletsch glacier, and afterwards eleven days exploring the range of glaciers which stretches from Monte Rosa to the Mont Cervin. From Zermatt he proceeded to Saas, and spent five days in the vicinity of the Allalein glacier: he afterwards visited the Fée glacier, and completed his expedition by a visit to the Mer-de-glace and its tributaries, and a second expedition to the summit of Mont Blanc.

The Paper contains an account of the observations made upon all these glaciers, and these observations go unitedly to prove that the production of the structure is independent of the stratification of the Névé, and is the result of intense pressure acting upon the glaciers. The author points out the place at which the structure is manufactured, and whence it is sent forward, giving a character to other portions of the glacier which have no share in its formation.

The observations include some which leave no doubt as to the general independence of structure and stratification. On the Furgge glacier, for example, fine ice sections are exposed, which show the bedding in a perfectly distinct and beautiful manner; while *crossing the beds at a high angle*, we have the true veined structure. The coexistence of both is exactly analogous to that of cleavage and bedding in slate rocks. While however the independence of both is thus proved, it is not asserted that the direction of structure and stratification never coincide. As the cleavage of rocks is sometimes parallel to the bedding, so may the strata of glaciers coincide with the structure; and this is probably the case in many of the so-called *secondary* glaciers of the Alps.

The author divides the questions of structure into three *principal* cases :—

1st. *Marginal Structure,* produced by pressure due to the swifter motion of the centre of the glacier.

2nd. *Longitudinal Structure,* produced by pressure consequent on the mutual thrust of two tributary glaciers ; developing veins which run parallel to the direction of the trunk stream.

3rd. *Transverse Structure,* produced by pressure due to the change of inclination,—and the thrust from behind, endured by glaciers at the bases of the ice-falls.

The author also gives a physical analysis of the mode in which the pressure produces the structure. He shows experimentally that planes of liquefaction are produced in ice at right angles to the direction of a pressure acting upon the mass. In the glacier these planes of liquefaction are the channels by which the air is ejected, and the blue veins produced.

A section of the Paper is devoted to the consideration of the shape of the bubbles entangled in glacier ice ; as affording evidence of pressure. The author has endeavoured to refer the observed facts to their true cause, and to show that the conclusions hitherto drawn from this remarkable phenomenon are untenable. The shape of the bubbles furnishes no ground for any conclusion regarding the pressure to which the mass containing them has been subjected.

The Paper also includes a short section containing remarks on glacier motion ; in which it is shown that this motion is of a composite character ; being partly due to the sliding of the glacier over its bed, and partly to the yielding of the ice under severe pressure. A brief section is also devoted to the explanation of the Dirt-bands of the Mer-de-glace.